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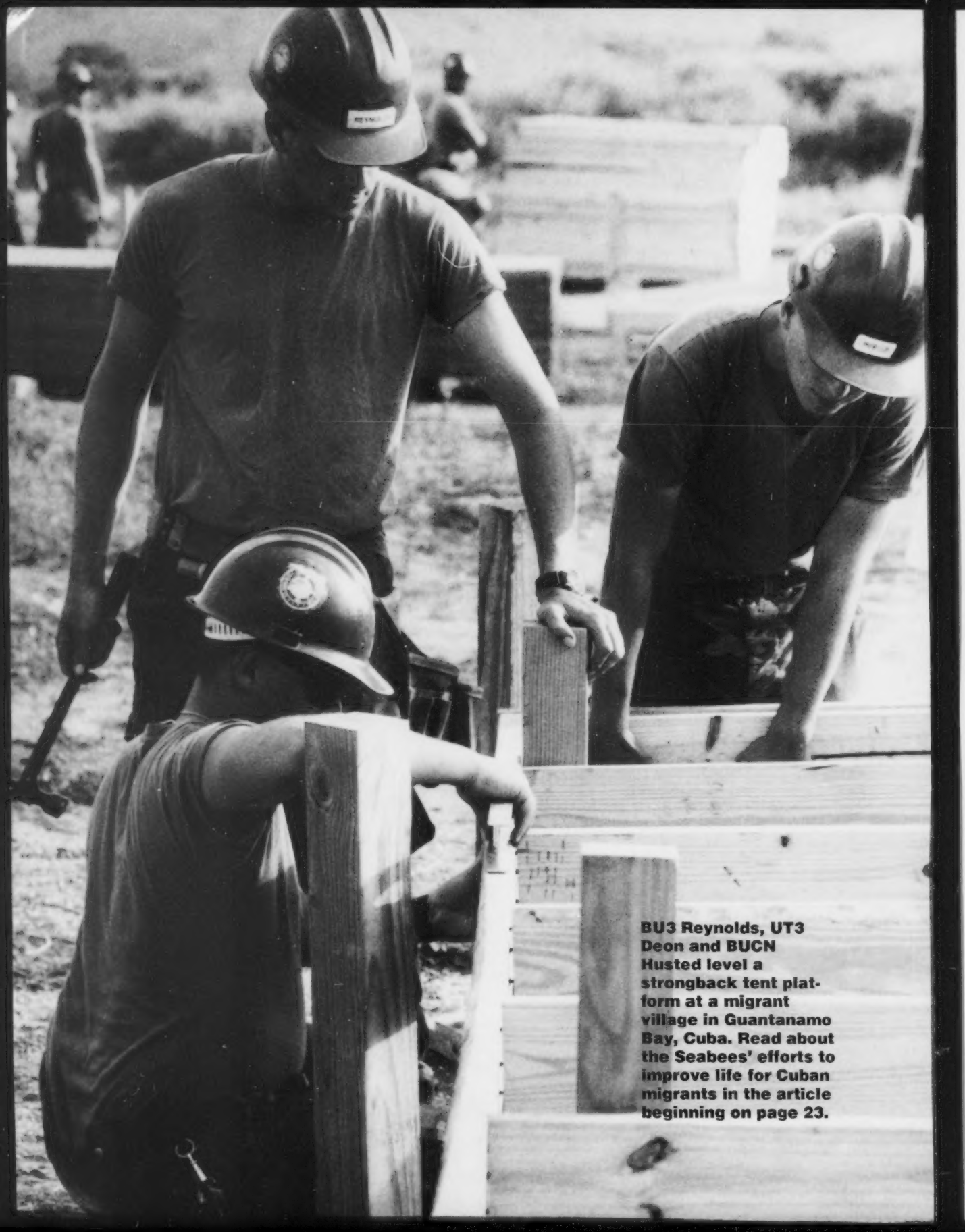

BU3 Reynolds, UT3 Deon and BUCN Husted level a strongback tent platform at a migrant village in Guantanamo Bay, Cuba. Read about the Seabees' efforts to improve life for Cuban migrants in the article beginning on page 23.

David J. Nash
Rear Admiral, CEC, USN
Commander,
Naval Facilities Engineering Command
and
Chief of Civil Engineers

Robert L. Moeller
Rear Admiral, CEC, USN
Vice Commander,
Naval Facilities Engineering Command
and
Deputy Chief of Civil Engineers

Elaine L. McNeil
Public Affairs Officer,
Naval Facilities Engineering Command

Karen Fedele
Editor,
Navy Civil Engineer Magazine
and
Assistant Public Affairs Officer,
Naval Facilities Engineering Command

Bill Brack
Cover Art
and
Contributing Artist,
Naval Facilities Engineering Command

Editorial Offices
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NAVY CIVIL **Engineer**

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Speaking from Topside

Five years ago, a Civil Engineer Corps officer could not present a brief without mentioning environmental concerns. The nation's conscience was in tune with environmental stewardship. Our citizens demanded fixes for environmental indiscretions of the past and assurances for protection of our environmental resources of the future. Installation, field division and headquarters environmental staff sizes grew rapidly to meet the challenge. The powerhouse environmental contractors were hiring people away from the Environmental Protection Agency (EPA) as fast as the EPA could train them.

After a half decade of intense buildup and robust spending, we have made significant inroads into environmental restoration. For example, the seaplane base at the Naval Air Station Whidbey Island, Wash., was recently removed from the National Priorities List. However, the remaining work continues to be formidable. Environmental restoration has proven to be time consuming and expensive. To a certain degree, the American public has been frustrated that our country's innovative and entrepreneurial prowess has not delivered a silver bullet to solve our problems quickly and cheaply. Although we have found no simple solution, we have greatly improved our ability to identify, assess and mitigate environmental problems.

We have come to know successful environmental restoration is a result of sound engineering and science, rational decision making and cooperation amongst owners, regulators and affected community members. Although the once lofty position of public and political environmental support has declined a few notches, the Navy maintains its resolve to demonstrate environmental leadership. It is not only important to the long-term sustainability of our natural resources, it is essential to the quality of life of our sailors, marines and civilians.

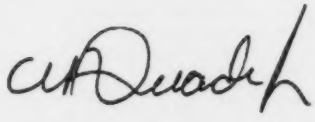
The Navy's leadership commitment is evidenced through many programs and initiatives. We have two Navy Environmental Leadership Program (NELP) demonstration sites—NAS North Island and Naval Station Mayport. At these active Navy bases, a concerted effort is underway to assimilate the latest and most effective means to accomplish environmental compliance and restoration. We host the Hydrocarbon National Test Site at Port Hueneme, Calif. Through the Western Governors' Association, we participate in a cooperative approach to develop technical environmental solutions, increase stakeholder involvement and streamline regulatory requirements. The Navy supports and encourages the growth of public-private partnerships to bring emerging technologies into common practice.

Our Base Realignment and Closure (BRAC) installations provide an immense challenge. The law requires all environmental restoration to be in place before the property can be transferred outside the federal government. If we used the environmental practices and relationships with communities and regulators that were the norm five years ago, we frankly could not do it. We have made substantial changes. We partner with regulators. We routinely execute interim removals up front, with studies to follow confirming the successful elimination of significant risks. We meet regularly with community members, including ardent environmental activists, through Restoration Advisory Boards (RABs). These new methods of environmental leadership have also been quickly and effectively applied beyond our BRAC programs.

William A. Quade Jr.

Cleanup at our active bases now centers on a relative risk based priority system. Through relative risk, we assess a site's contaminant, migration pathway and potential receptors. This enables the Navy to focus scarce funding for the highest risk locations, working cooperatively with regulators and the public. The result is a balanced program that is environmentally protective and sensitive to the community concerns.

The need to preserve and protect our environment is more important today than it ever has been. Unfortunately, we have seen the peak of environmental funding. This does not mitigate our responsibilities, it enhances them. It forces the Navy to rise to the challenge of improving our environmental management programs. We must prevent pollution before it occurs. This includes integrating environmental compliance as an integral part of mission accomplishment. Restoration programs must carefully establish cleanup priorities, minimizing extensive studies while maximizing contamination removal/destruction efforts. Program managers have to keep abreast of the latest technological advances. Most importantly, those managing the Navy's environmental programs must communicate openly and effectively with our installation commanders and their staffs, regulators and community stakeholders.



WILLIAM A. QUADE JR.
Director of Environment,
Naval Facilities Engineering Command

Environmental design: LANTDIV moves toward faster cleanup of hazardous waste sites

By Susan M. Hauser, P.E.
Edward J. Gallaher IV, P.E.

After years of studying environmental sites, comparing technologies, and negotiating remediation goals, we are now going into the field to clean up the sites! But how do we design environmental cleanups? What contractors will do the work? With numerous site uncertainties, how do we put together competitive, low bid contract documents? Most importantly, how can we start remediation quickly and retain necessary controls?

For the past several years, the Atlantic Division (LANTDIV) of the Naval Facilities Engineering Command (NAVFAC) has been working to answer these questions. LANTDIV has taken steps to get to cleanup faster, including using a new contracting vehicle for construction work, streamlining the design process with a new environmental design philosophy (sometimes less design is better), and starting an interface program between the designer and the contractor.

As with all the engineering field divisions in NAVFAC, LANTDIV is using remedial action contracts (RACs) for construction remediations. The RACs are cost-plus/award fee contracts, with each construction project an individually negotiated delivery order.

LANTDIV selected one RAC contractor for all multi-contaminant environmental waste sites and one RAC contractor for all petroleum-oil-lubricants (POL) environmental sites. Once our construction contractors were selected, LANTDIV began looking for ways to take advantage of the cost-plus nature of these contracts.

NAVFAC has historically been in the bricks and mortar business, overseeing the design and construction of Navy shore facilities around the world. When the environmental business evolved to actual construction, it was assumed that the same detailed method of design used for buildings would be appropriate. However, a typical environmental job involves removing a contaminated medium (soil, water or sediment), treating it and restoring the site.

The technology to accomplish the remediation is usually selected during the study phase. However, too much time was spent designing a relatively small amount of permanent work. With this in mind, LANTDIV developed a RAC design philosophy, specifically tailored for environmental projects accomplished by the RAC contractor.

The LANTDIV philosophy regarding design packages for the remedial action contracts (multi-contaminant and POL) is to select a remedial action contractor based on the contractor's expertise in contaminated site remediation.

The remedial action contractor uses that expertise to develop the appropriate treatment and remediation process for each project. While selected for expertise in environmental construction, the remedial action

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Susan M. Hauser is an environmental engineer in the Environmental Support Branch at the Atlantic Division, Naval Facilities Engineering Command in Norfolk, Va. Edward J. Gallaher IV is a civil engineer in the Specifications Branch at LANTDIV.

LANTDIV is making significant progress in getting to cleanup faster.

contractor's expertise is not intended to extend to general building construction. Therefore, the environmental design packages provide *general direction* to the remedial action contractor for items directly related to the treatment and remediation processes (treatment facilities), provide *specific direction* to the remedial action contractor for items of a more general construction nature (permanent facilities) and provide *no direction* for those items of a solely temporary nature (temporary facilities).

Facility types

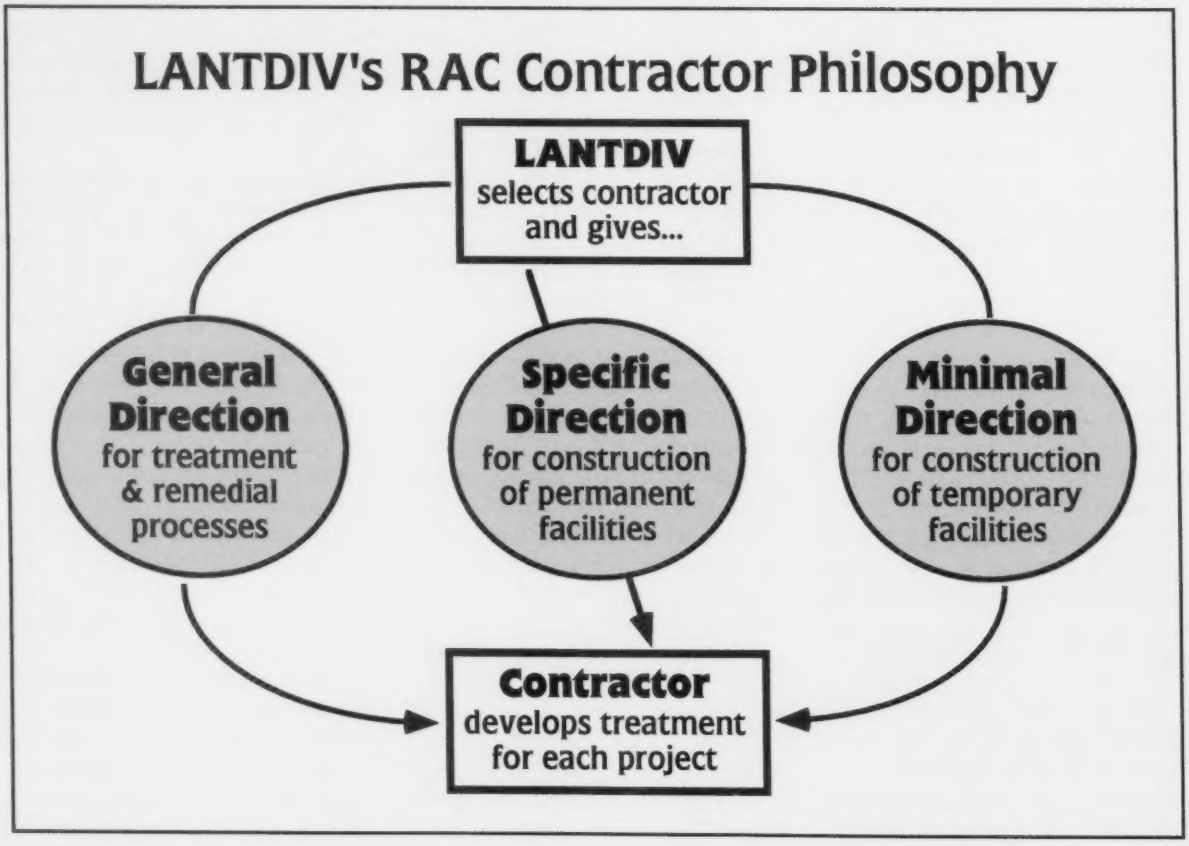
These design efforts are required for these facility types.

• **Temporary facilities** are any item or construction effort necessary for remediation that will be removed from the site when the remedial action contractor completes the contract delivery order. Examples are safety fencing, decontamination pads, laydown areas and gravel roads.

Design effort required: No design effort required. No details or specifications are required. The remedial action contractor should indicate the location of temporary items on the project plans when known.

• **Permanent facilities** are any item or construction effort necessary for the remediation, exclusive of the treatment facilities that will remain on site when the remedial action contractor completes the contract delivery order. Examples are buildings, new or relocated utilities, permanent structures, new roads or replacement patching.

Design effort required: Complete design effort required. The remedial



action contractor provides plans and specifications, complete with plans, sections, details and detailed specifications.

• **Treatment facilities** are any item or construction effort associated with the recovery/treatment/remediation systems. Examples are complete recovery systems, complete treatment systems and utilities associated with the treatment system.

Design effort required: Conceptual design effort required. The remedial action contractor provides a schematic layout of treatment and recovery systems. The remedial action contractor also provides performance type specifications for the treatment systems, paying particular attention to the testing requirements for the systems.

Design philosophy

With LANTDIV's design philosophy, the primary focus for the remedial action contractor is the treatment facility. The designer provides a detailed conceptual design of the system and performance specifications (including cleanup goals, operating performance parameters and flow levels). The remedial action contractor provides a detailed design of the system in the workplan, constructs the system and makes sure that it operates within the specified performance criteria. In this way, the success of the system operation rests solely with the remedial action contractor, and his expertise is fully realized.

Design time has been drastically reduced with this new philosophy. A typical excavation project now requires only one or two sheets of drawings detailing the project location and approximate limits of contamination. Performance specifications with cleanup goals are provided. Even projects requiring permanent facilities to house treatment systems have reduced design times.

The buildings require less detail, and the treatment systems are provided as a conceptual design. The remedial action contractor provides a working treatment system from the conceptual design, which also reduces design time. The remedial action contractor uses its expertise to build in the most feasible and economical manner.

Some environmental projects deal solely with the excavation and disposal of a contaminated soil. These projects require no permanent change to the site. In these instances, a more streamlined set of plans and specifications, called a scope of work design, can be used for construction.

The LANTDIV philosophy regarding design packages for the remedial action contracts (multi-contaminant and POL) is to select a remedial action contractor based on the contractor's expertise in contaminated site remediation.

This design involves an expanded Section 01010 of the specifications in the scope of work design, accompanied by one or two sketches. The site layout, approximate extent of contamination and the location of the site are shown in the sketches. The regulatory requirements (such as cleanup levels) and any special conditions are included in Section 01010. After receipt of the design documents, the remedial action contractor produces a detailed workplan indicating the methods of construction and then mobilizes in the field. This type of design can be accomplished in as little as one week!

Partnering

LANTDIV is moving forward with the team concept and partnering. Both are essential to the execution in the fast-paced and complex world of environmental remediations. LANTDIV has initiated the concept of the CLEAN (Comprehensive, Long Term Environmental Action, Navy) and remedial action contractor interface.

The CLEAN contractor is the designer of record for the designs and has typically worked on the project during the study phase, in which the remedy selection was made. The remedial action contractor has additional knowledge of innovative technologies and constructability requirements that could be useful to the CLEAN contractor. The CLEAN and remedial action contractor interface process allows the remedial action contractor to buy-in to the design by providing useful input during the design.

The CLEAN and remedial action contractor interface provides many benefits. Shared information between the CLEAN and the remedial action contractors allows for greater understanding of the site conditions, and a smoother construction action.

LANTDIV is making significant progress in getting to cleanup faster. Our new design philosophy reduces design time. Early remedial action contractor involvement benefits all by providing innovative, cost effective and constructable remediation projects. ❑

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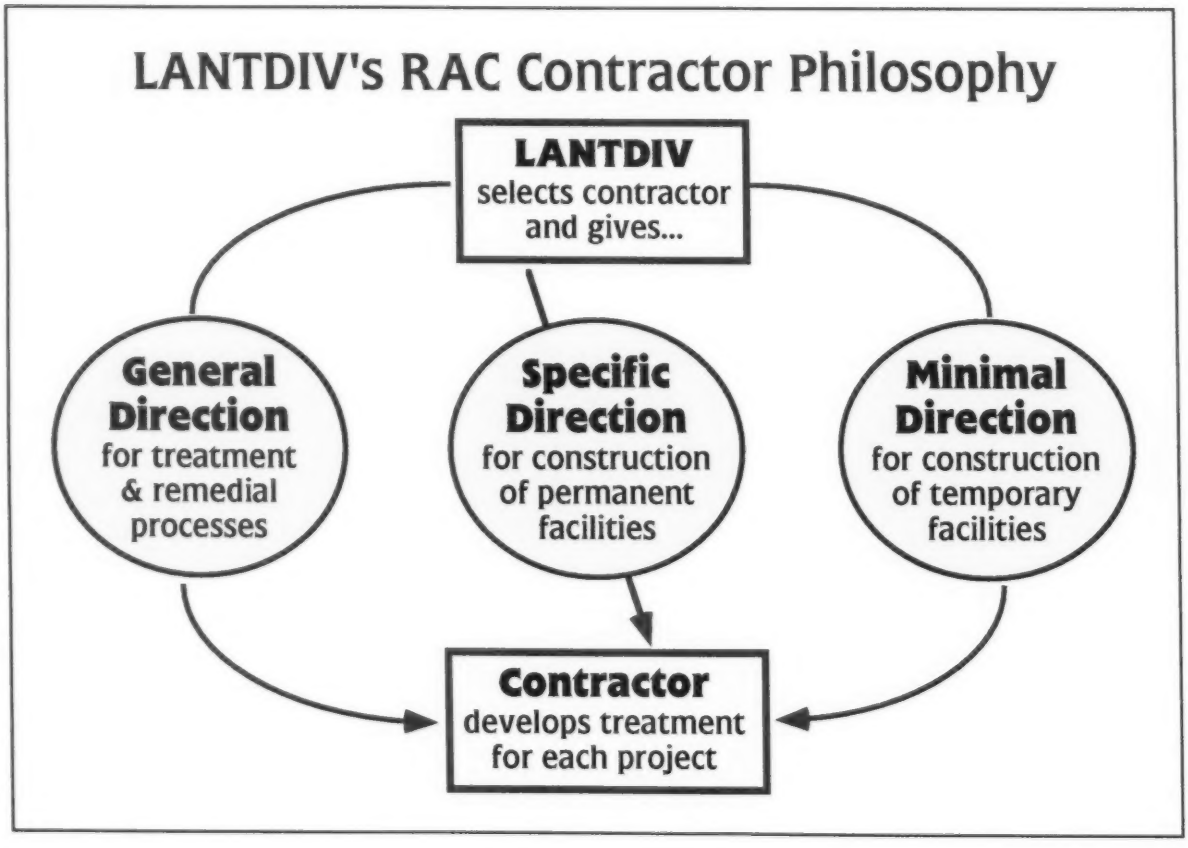

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Heap pile bioremediation is an effective and economical method to remediate hydocarbon impacted soil

By Jeff O'Connor
John Wollenberg

Heap pile bioremediation is a viable, cost-effective and easy method to remediate hydrocarbon impacted soil. Microorganisms indigenous to a heap pile bioremediation facility consume the hydrocarbons as their primary food and energy source, producing nontoxic by-products (carbon dioxide and water). Indigenous microorganisms are more likely to survive in their natural environment and require less nurturing than exogenous microorganisms.

A bioremediation facility was recently constructed at the Marine Corps Air Station (MCAS) in Yuma, Ariz. The MCAS facility can remediate approximately 1,200 tons of soil per cycle. Cycle completion requires three to four months, depending upon hydrocarbon type and concentration. The facility is constructed on a 100 foot by 100 foot 10-inch thick concrete pad underlain with a 60 mm polyethylene liner. The pad contains four cells separated by 4 foot high concrete walls. This allows for soil with differing hydrocarbon concentrations and clean up level requirements to be treated continuously and simultaneously on an independent basis.

The concrete pad is sloped to a sump and oil water separator where liquids can be treated before discharge into the sanitary sewer. Water runoff and atmospheric emissions from soil piles are minimized by an impermeable cover. Soil piles are approximately 4 feet high and constructed on top of perforated pipes, which are connected to a vapor extraction/air injection unit.

This unit has two functions. First, it extracts (negative pressure) volatile hydrocarbon components from soil and destroys emissions through a catalytic oxidizer. Second, once volatile hydrocarbons are removed, the unit injects air into soil piles, raising soil oxygen content necessary for microbial stimulation. If the soil monitoring indicates the need for additional nutrients, a nutrient injection system that works in tandem with the drip irrigation system is activated.

Essential bioremediation components

These are the major components necessary for this type of bioremediation.

Oxygen. Like all living organisms, microbes need oxygen to thrive. If soil oxygen content drops below the natural atmospheric oxygen level, microbial consumption of hydrocarbons becomes less efficient. At the MCAS Yuma facility, oxygen is supplied by injecting air through a piping network in the soil piles. Soil oxygen content level is closely monitored to maintain the optimum soil oxygen content level of approximately 21 percent.

Water. Water is essential for microbial activity. The soil moisture content level is carefully regulated, because insufficient soil moisture inhibits microbial activity. Excessive moisture may "drown" microbes. Varying soil types require different amounts of moisture. However, optimal soil moisture content is typically between 10 percent and 25 percent.

Jeff O' Connor is an environmental engineer at the Southwest Division, Naval Facilities Engineering Command in San Diego, Calif. He did the concept design for the bioremediation system at MCAS Yuma, Ariz. John Wollenberg is an environmental protection specialist at the Naval Facilities Engineering Service Center in Port Hueneme, Calif.

Nutrients. Nutrients generally required for microbial proliferation are nitrogen, phosphorous, potassium, sulfur, magnesium, calcium, manganese, iron, zinc and copper. Insufficient nutrients reduce microbial activity. Nitrogen and phosphorous are most likely to be deficient in hydrocarbon impacted soil. These nutrients are introduced through a liquid injection system or applied in solid form during soil pile construction. The liquid injection system at Yuma is ideal for supplying nutrients.

pH. pH affects the solubility of certain components in soil. By elevating pH, metals which adversely affect microbes become less soluble.

Temperature. Temperature also affects biodegradation rate. Microbial activity slows with significant temperature decrease. Conversely, very high temperatures can essentially sterilize soil, creating an adverse environment for certain microbial activity. While microbes digest hydrocarbons, heat is given off within soil piles, often raising soil pile temperature 10 to 30 degrees Fahrenheit. Optimum atmospheric temperatures typically range from 50 to 100 degrees Fahrenheit.

Treatability or feasibility studies. Profiling soil before remediation maximizes the efficiency of the bioremediation. Profiling identifies the indigenous population of microbes, nutrient levels and soil characteristics such as pH, porosity and moisture content.

Treatability study and degradation

A comprehensive scientific assessment of the soil is performed before the bioremediation of hydrocarbon impacted soil. Laboratory analysis ascertains types of microbes present in impacted soil and optimal conditions for expedient biodegradation. The data generated are helpful in creating an idealized environment in which microorganisms thrive and multiply. Under optimal soil conditions (non-compacted, sandy loam is ideal) indigenous microorganisms use hydrocarbons as a food source and convert them to carbon dioxide and water.

At designated intervals during bioremediation, the levels of end products (carbon dioxide and water) are monitored in conjunction with hydrocarbon levels. As bioremediation progresses, carbon dioxide levels increase and oxygen levels decrease. The air injection system stabilizes oxygen levels necessary for maintenance of the bioremediation process. Upon completion of hydrocarbon degradation, microorganisms become dormant, because they have exhausted their food source.

System monitoring

Treatment piles are monitored at specified intervals throughout remediation. Microbial activity evaluation

This heap pile bioremediation system is similar to the one constructed at MCAS Yuma.

includes enumeration of heterotrophic soil microbes in treated soils using standard microbiological laboratory culturing techniques. Soil vapor probes installed throughout treatment cells monitor soil gas concentrations of carbon dioxide and oxygen.

Treatment cell pipes supply air throughout cell piles. Pressure probes are positioned throughout the treatment cell piles at predetermined depths and locations. The probes provide vacuum monitoring of the cell piles during aeration system operation.

Data collection to monitor system performance begins immediately after startup and continues at designated intervals during the bioremediation. Generated data are used in conjunction with computer-based reconstruction design to determine if adjustments to approach are required.

Probes are constructed using 0.020-inch slotted, 2-inch PVC. Probes are 1 foot in length and placed horizontally at varying depths within each treatment cell. The probes are capped with PVC caps and connected to Tygon tubing leading to the surface of the pile. The end of the Tygon tubing is fitted with a valve to allow vacuum readings and monitoring of oxygen uptake.

During treatment, carbon dioxide and oxygen concentrations in the off-gas from the treatment cell soil piles are monitored to track oxygen use and carbon dioxide evolution. Generated data are used to evaluate nutrient supply requirements and remedial treatment progress. Carbon dioxide in the air stream is monitored with a meter calibrated to 2.5 percent carbon dioxide with a nondispensive infrared (NDIR) light of a specific wavelength. Oxygen in the air stream is monitored with a portable oxygen meter using electrochemical sensors calibrated to atmospheric oxygen concentrations of 21 percent.

The treatment system's design facilitates soil microorganism activity to enhance biodegradation of the hydrocarbon impacted soil in treatment cell soil piles. Microbial population density is measured by using standard plate-count laboratory procedures. Oxygen uptake rates are directly related to microbial activity.

A change in microbial oxygen uptake consumption indicates the system is either nutrient limited or approaching the end point. Oxygen uptake rates are determined by temporarily turning off the aeration system and assessing treatment cell soil pile oxygen and carbon dioxide levels. Oxygen and carbon dioxide concentrations are monitored at six and 24 hour intervals after turning off the aeration system. Acquired data are used in determining oxygen uptake rates to assess the relative "health" of the microbial population.

Biodegradation assessment of petroleum hydrocarbons is conducted by soil sampling and analysis. The analysis includes total petroleum hydrocarbons (TPH), and benzene, toluene, ethylbenzene and xylene (BTEX). Soil nutrient conditions, soil pH and soil moisture are also monitored. These analytical methods are used to characterize the soil:

- TPH (EPA Method 8015-modified)
- Soil nutrient conditions
- BTEX by EPA Method 8020
- pH and moisture content

Major points of construction

The major construction steps for a bioremediation facility are:

- Choose a site (level and not in flood plain)
- Prepare site for pad construction
- Lay down HDPE liner and weld all seams
- Install protection over liner to prevent puncture during construction (sand mat or slurry mat)
- Install forms and rebar for slab and containment walls
- Pour and finish concrete
- Install piping for vapor extraction/air injection unit
- Install irrigation/nutrient injection system
- Load soil into cells
- Begin remediation

Bioremediation facilities economically remediate hydrocarbon impacted soils, which typically contain gasoline, diesel and jet fuels. Remediation costs are estimated at $25 to $30 per ton, depending upon regulatory requirements. Construction costs range from $350,000 to $500,000 for a facility able to process 1,200 tons per cycle. Remediation times vary depending upon hydrocarbon concentrations, nutrients, temperature and microbial conditions. The indigenous microbe soil population is usually sufficient for bioremediation. However, if the indigenous microbe population is low, laboratory cultured exogenous microbes are commercially available. ❑

For more information, call Jeff O'Connor at Southwest Division, Naval Facilities Engineering Command at (619) 532-2454; Robert Kratzke at the Naval Facilities Engineering Service Center (NFESC) at (805) 982-5844; or John Wollenberg, NFESC, at (805) 982-5844.

The excavator clears the storage pad.

RAC used to removed PCBs from base

By LCDR William J. Bender, CEC, USN, P.E.

A Naval Facilities Engineering Command's cost reimbursable remedial action contract (RAC) was successfully used to remove PCBs (polychlorinated biphenyls) from an old storage site at the Naval Surface Warfare Center, Carderock, Md. PCBs are harmful to animal life, and if left on station they would have eventually migrated into the Chesapeake Bay ecological system.

LCDR William J. Bender was the resident officer in charge of construction at ROICC Bethesda during this project.

The project included cleaning scrap metal, and excavating sediment control ditches, storage pads and soil up to five feet deep. All water used for cleaning the scrap metal was treated on site. More than 3,000 cubic yards of PCB-contaminated material were removed and transported to an appropriate permitted landfill.

Analysis of soil samples revealed that the area was intensely contaminated with PCBs. However, the extent of contamination could not be determined without incurring high costs.

Originally, a low bid performance specification was awarded. Due to inconsistencies in the specification and the potential for long-term liability issues, this contract was terminated for convenience after several months. The removal action resumed when a delivery order was negotiated with the RAC contractor, OHM Corporation of Findlay, Ohio.

A RAC contract takes a different approach than the typical low bid contract. In the RAC, all reasonable costs are borne by the government. Thus, the government contract administrator (in this case, Resident Officer in Charge of Construction

Bethesda) takes an active role in cost management.

A teamwork relationship between the government and contractor personnel is essential to reducing cost and obtaining timely performance. Clear and constant communications result in success.

To prevent the contractor from going off in several directions, clear roles and responsibilities among government personnel were established through a preconstruction conference.

Only the ROICC could provide direction to the contractor. Government and contractor personnel formed a team and kept communicating throughout the project by holding weekly meetings at the project site. Discussed at the weekly meetings were the schedule, quality, cost and planned operations. The contracting officer attended the meetings to gain consensus and provide timely direction.

This project finished early. Additionally, the partnering efforts paid off in reducing the estimated cost by $500,000. Examples of team efforts that resulted in savings were being flexible in interpreting the specifications; timely return and reasonable comments on submittals; reduced excavation when testing showed an acceptable PCB concentration; working with the contractor so they could complete the project as soon as possible (for example, working Saturdays and holidays); cleaning, testing and recycling scrap instead of assuming it was too contaminated to clean; and not replacing fill in the sediment control ditches.

Partnering efforts between the government and contractor personnel resulted in a win-win relationship. Because of the contractor's outstanding performance, the maximum fee was awarded. ❑

Workers cut up scrap metal.

A truck is loaded with PCB-contaminated soil.

Don't let rust bust your UST: Corrosion protection of underground storage tank systems

By Thomas Tehada, P.E.

Underground storage tank (UST) regulations promulgated in December 1988 (40 CFR Parts 280 and 281) require owners to replace or upgrade existing UST systems to meet the performance standards for release detection, corrosion protection, and spill and overfill prevention. The regulations require corrosion protection, spill and overfill protection for USTs by December 1998. Given normal project execution schedules, the time is *now* to start planning to meet the requirements.

Those in overseas areas not governed by U.S. laws must follow Chapters 6 and 19 of the Department of Defense Overseas Environmental Baseline Guidance Document (OEBGD) or the Final Governing Standards for the host nation concerned if issued by the Executive Agent. The requirements of the OEBGD for USTs are generally the same as those of U.S. laws, except the deadline for complying is Jan. 1, 1999, for USTs storing hazardous substances, and Oct. 1, 2004, for USTs storing petroleum, oil and lubricant (POL) substances.

Corrosion protection for UST systems

Essentially, if UST systems are not fiberglass or fiberglass clad, corrosion protection *must* include testing to ensure the integrity of the tank *and* provision of cathodic protection (CP). (For detailed corrosion protection options for UST systems remaining in service beyond 1998, see *Must for USTs*, published by the Environmental Protection Agency Office of Underground Storage Tanks.)

For USTs at overseas installations, the OEBGD, as a minimum, requires cathodic protection or other corrosion protection by Jan. 1, 1999, for USTs storing hazardous substances, and by Oct. 1, 2004, for USTs storing POL products. Additional requirements may be dictated by the Final Governing Standards determined for the host nation.

Thomas Tehada is a cathodic protection consultant at the Pacific Division of the Naval Facilities Engineering Command in Pearl Harbor, Hawaii.

USTs generally have associated buried steel piping. UST regulations require CP for that piping. Data on UST systems in the United States indicate that most leaks occur in the system piping. Therefore, from a corrosion standpoint, it makes sense to provide CP for the piping system.

CP of these piping systems has been often overlooked:

- Fiberglass UST systems installed with associated buried metallic piping systems
- Tanks installed to meet the Steel Tank Institute STI P3 standard. This standard specifies a corrosion protection system for the tank but not for the piping system. (See the *STI P3, Specification Manual for External Corrosion Protection of Underground Storage Tanks*, 1989, published by the Steel Tank Institute, Lake Zurich, Ill.)

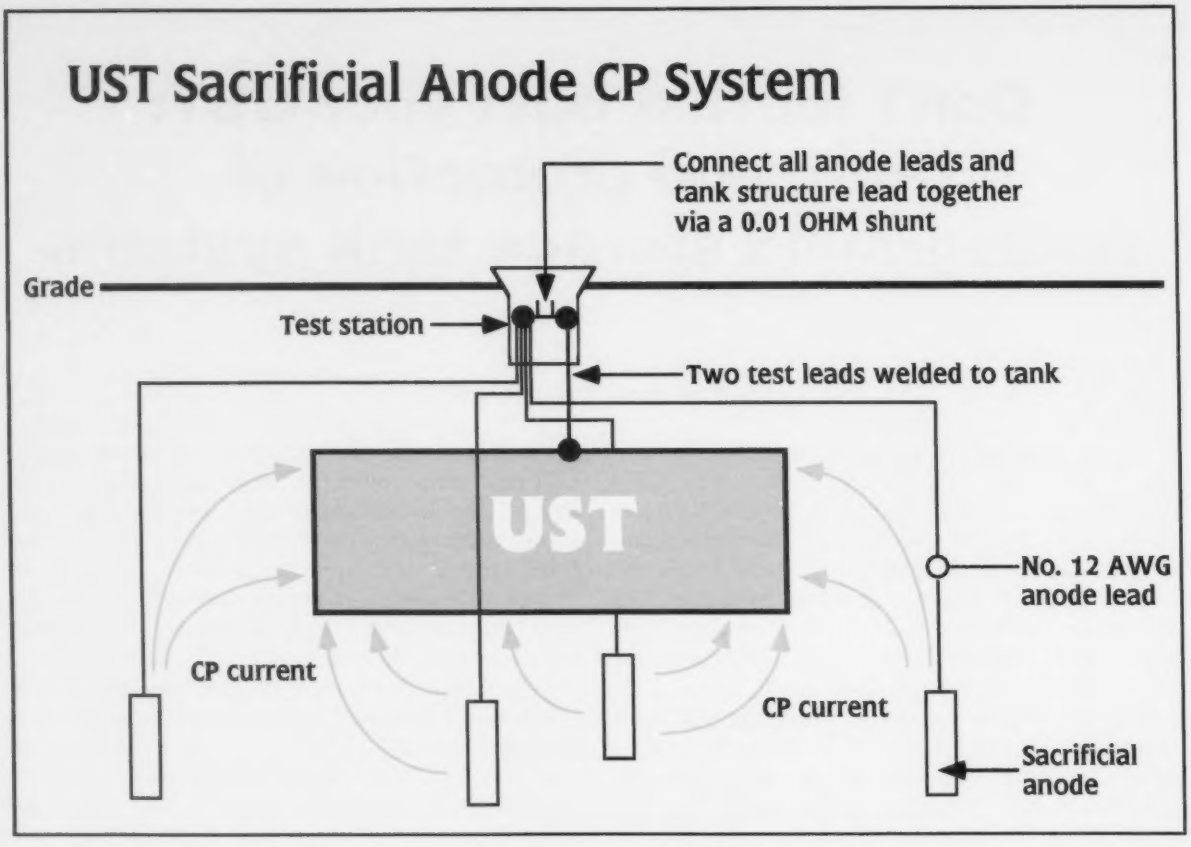
Many USTs have been replaced with aboveground storage tanks (AST) with buried metallic piping. A good portion of UST leaks were found in the piping systems. Although no statutes require CP for small AST systems, the buried piping systems for ASTs should also be cathodically protected. Leakage from these pipelines could cause environmental problems.

Cathodic protection

Cathodic protection is an electrochemical method of preventing metallic corrosion. Electrodes, or anodes, installed in an electrolyte (normally soil or water) continuously pass direct electrical current to the metal being protected, the cathode. Corrosion is not eliminated but is directed to a less costly and expendable anode material while the more valuable structure is protected.

Two types of CP systems are used, depending on conditions.

The **galvanic, or "sacrificial anode,"** system uses material such as magnesium or zinc that is electro-potentially more active than steel. These materials, when electrically connected to steel in conductive soil or water, form a galvanic cell—similar to a battery—in which the more


UST Sacrificial Anode CP System
Connect all anode leads and tank structure lead together via a 0.01 OHM shunt
Grade
Test station
Two test leads welded to tank
UST
No. 12 AWG anode lead
CP current
CP current
Sacrificial anode

active metal corrodes to protect the more noble metal (steel). Normally, galvanic systems are applied only to new, well-coated UST systems or existing UST systems with low CP current requirements. Soil resistivity is an important consideration.

The second type of CP system—**impressed current**—uses some outside source of DC voltage and current, most commonly a transformer-rectifier, to generate the required power. The DC power source is connected to an anode that discharges the protective current (corrodes). Impressed current anodes can be high-silicon cast-iron, graphite or other precious metal materials. Generally, this type of system is applied when CP current requirements are large, soil resistivities are high or when special conditions require this type of system.

UST regulations require field installed CP systems be designed by a corrosion expert. A corrosion expert is:

- A registered professional engineer with certification or licensing that includes education and experience in corrosion control on buried or submerged metal piping systems and tanks

OR

- A Nation Association of Corrosion Engineers (NACE)-accredited or certified corrosion specialist or CP specialist.

Our A-E contracts should specify that the corrosion expert have a minimum of three years of recent experience in the design of CP systems for USTs or other buried metallic structures.

Many existing USTs were specified to conform to the STI P3 standard, which includes a pre-engineered tank corrosion protection system. The system has three methods of corrosion control:

- Dielectric coating
- Pre-engineered sacrificial anode cathodic protection
- Dielectric insulating bushings at pipeline connections

Designers should not specify this system without first investigating soil conditions at the UST installation site. The STI P3 CP system, designed for a 30 year life in a certain soil resistivity, will work in most installations. However, the CP may not work if installed in continuously dry, high resistivity soils, especially if the protective

coating on the tank is damaged. Corrosion is generally minimal in dry, high resistivity soil. STI P3 designs should also include a CP testing system—a common omission in the past—to permit the required testing. Most importantly, the STI P3 system provides CP *only* for the tank, and you *must* provide a separate CP system for any associated buried metallic piping.

Your UST must comply with the regulations. Question any design where the type of corrosion protection is unclear. To make sure no USTs go unnoticed, review all design drawings for repair or construction of facilities which commonly have storage tanks. These facilities include:

- Emergency generator buildings
- Buildings with boiler/central hot water system room (such as bachelor quarters and dining facilities)
- Wash racks
- Service and filling stations
- Vehicle maintenance shops

Some of these USTs may not be regulated, but providing CP is still wise, since corrosion does not distinguish between regulated and unregulated USTs. A leak in an unregulated system could cause unwanted environmental problems.

UST CP system testing requirements

Periodic inspections and testing of the CP systems must be conducted to ensure their continued, effective operation. The 40 CFR Part 280.31 specifies CP system testing requirements :

- Inspect and test impressed current system rectifiers every two months as a minimum.
- For all CP systems, take structure-to-electrolyte (S/E) test data within six months of installation and every 36 months as a minimum. All test data must meet the criteria of a nationally recognized code of practice, such as NACE RP0285.

General CP testing requirements in NAVFAC MO-307 and engineering field division (EFD) instructions are more stringent than in 40 CFR Part 280.31. NAVFAC and the EFDs require submission of a CP installation report within three months of system installation, monthly rectifier inspections and annual S/E testing as a minimum. UST regulations require CP systems to be tested by a qualified person. The Environmental Protection Agency's minimum requirements for a cathodic protection tester are:

- A person who is qualified as a corrosion expert
- A person who is certified under one of the following three levels of NACE certification:
  - Senior corrosion technologist
  - Corrosion technologist
  - Corrosion technician (if supervised by someone certified at one of the previous two levels or as a corrosion expert)

The regulations also require keeping records on UST CP system maintenance and operation. The records must show the results of the last three rectifier inspections and the last two annual CP system S/E tests.

Common causes of CP system failure

Many of the Navy's UST CP systems have failed prematurely. Some of the common causes are:

- **Defective, missing or improper placement of electrical insulating devices.** This is a common cause of failure. Electrical insulating devices in the UST pipelines to the equipment prevent other electrically continuous buried metallic structures, such as utility pipelines or building grounding systems, from draining away CP current intended for the UST system. Insulators should be installed aboveground, just prior to entering a building. If the pipelines emerge from the ground inside the building, locate the insulators at a convenient point just after the pipes emerge from the floor, not underground. This siting will allow future testing.

- **CP system improperly designed.** Many failed systems were designed without determining the site soil conditions. Soil resistivity is an important part of the selection and sizing of CP system components. As a minimum, all CP designs should include soil resistivity field tests. All UST piping should be cathodically protected. Contact your EFD CP program manager if you have questions.

- **CP system improperly installed.** Common causes include insulators or test stations not installed, wrong anodes installed, the *plastic* bag on sacrificial anodes not removed before installation, improper installation of pipelines through the dielectric bushings on an STI P3 tank, damaged tank coating not repaired and poor weld connections.

Correct these deficiencies before backfilling. Once covered, it is difficult to determine the specific cause of failure and correct the deficiency.

- **CP systems not maintained** because of low priority due to limited funding, little emphasis due to non-visibility, unfamiliarity with requirements, lack of qualified personnel or simply because their existence is unknown. Inattentiveness to the CP systems, come 1998, will result in non-compliance.

Include all CP systems in a maintenance program *now*. Hazardous materials should not be leaked into the ground, where they can cause other environmental, safety and critical mission problems. Failure to maintain CP systems now could result in their being ineffective by 1998. The EFD CP program manager can assist in developing a maintenance program.

CP technical assistance

Most cathodic protection A-E firms should have qualified personnel. Contact your EFD CP program manager or the NAVFAC cathodic protection consultant at the Pacific Division of the Naval Facilities Engineering Command if you need assistance. The EFDs may have personnel who meet the minimum EPA qualifications, or may have access to indefinite quantity A-E contracts with firms having the qualified personnel.

Some of these USTs may not be regulated, but providing CP is still wise, since corrosion does not distinguish between regulated and unregulated USTs. A leak in an unregulated system could cause unwanted environmental problems.

Your EFD CP program manager may also be able to arrange a base-wide corrosion control survey, including other facilities besides USTs, of your activity. As part of the NAVFAC Corrosion Control Program outlined in NAVFACINST 11014.52, you should have your activity surveyed every five to seven years. Survey more often if you have large fuel storage and distribution systems or numerous metallic UST systems. ❑

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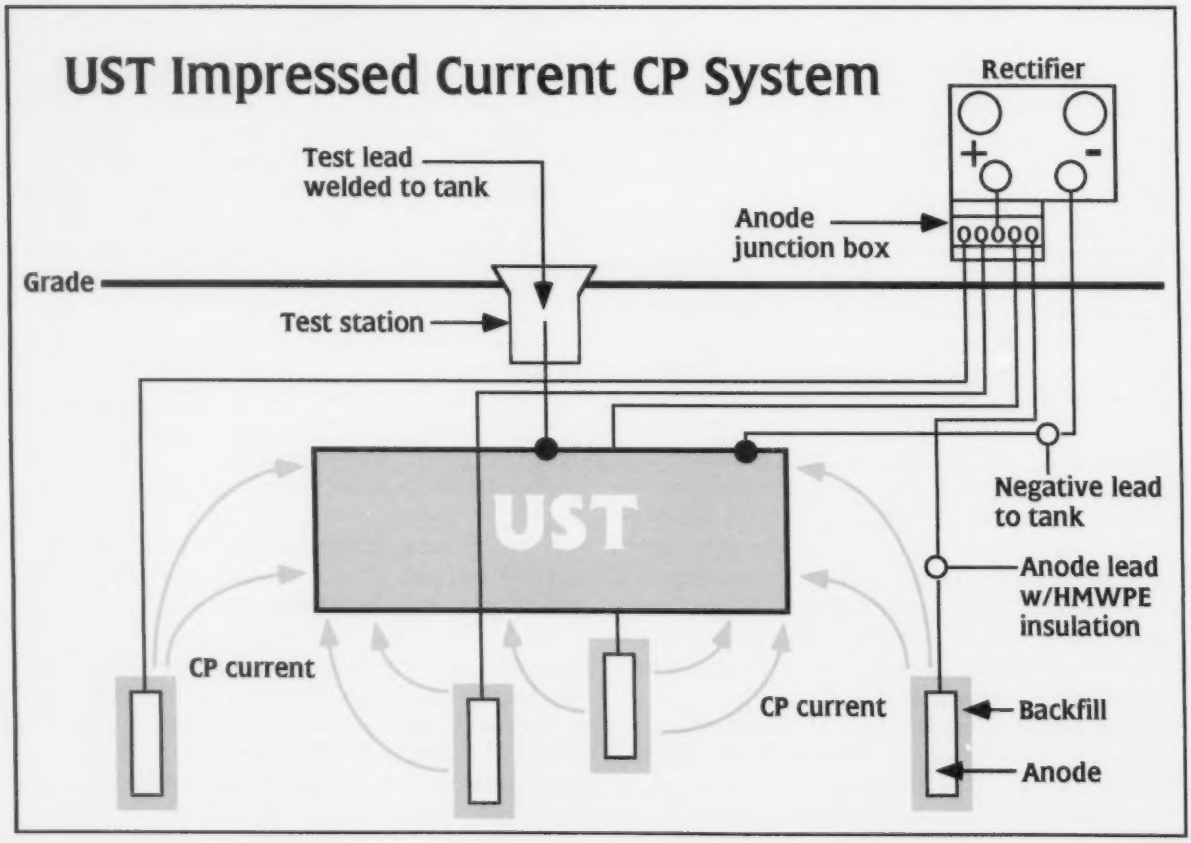
The Pacific Division of the Naval Facilities Engineering Command has been assigned as the shore facilities cathodic protection center of expertise under the Navy's Specialized Expertise Program. If you have CP questions, the point of contact is Thomas Tehada, DSN (315) 474-5360, commercial (808) 474-5360 or fax (808) 471-5870.



Let's try reengineering the public works service delivery process

By CDR Donald H. Orndoff, CEC, USN

We need to change the way we do public works business in the Navy. This article discusses why and how.

Why change?

Significant forces of change are challenging our current methods of providing public works support:

Downsizing, base closure and realignment. The pressures of downsizing the Navy shore establishment are continuing. The public works organizations of the impacted activities must also undergo major change, either expansion or contraction. This period of mandated change presents an excellent opportunity to make fundamental improvements in how public works services are provided.

Reduced public works budgets. The Department of Defense (DOD) and Navy will continue to reduce the cost operating shore bases. Navywide, the cost of public works services approaches $4 billion. Public works support, which is at least 50 percent of the base operating budget, is the largest target of opportunity. To maintain our facilities' current condition, we need to invest annually 1.75 percent of the plant replacement value. The recent trend is to fund well below this target, generating a growing backlog of deferred real property maintenance (RPM). This trend, left unchecked, will force us into breakdown repairs, significantly driving up facility life cycle cost and exacerbating the problem.

Pressure to outsource. Public works support is an attractive target for outsourcing. Outsourcing is when support functions outside of the primary mission area are procured from the private sector.

Customer perception. When polled at a recent Installation Commander's Conference, base commanding officers identified public works as the number 2 barrier in accomplishing the base mission. This is an unhealthy condition for a service organization in a period of declining resources.

Evolution of business processes. We currently provide public works services from two platforms that were designed more than 50 years ago: public works departments (PWD) and public works centers (PWC). Both have incrementally changed. During this period, business processes in the private sector have undergone enormous change, combining progressive management theory with the power of automation. By private sector standards, our public works service delivery processes are outdated.

How do we react to the forces of change?

We can react to the forces of change by taking the wait and see approach, trying continuous improvement or reengineering the delivery process.

The wait and see approach is a formula for failure. The forces of change are too great and too fast for the Navy to be in a reactive mode. Although much better than wait and see, the continuous improvement approach is still too slow to deal with the dynamic challenge before us.

The answer is to reengineer the service delivery process. Reengineering is the "fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed," according to Michael Hammer in *Reengineering the Corporation.*

Strengths and weaknesses of our existing service delivery platforms

Public works departments typically support shore bases that are remote from other activities. The PWD's

CDR Donald H. Orndoff is the operations officer at Navy Public Works Center San Francisco Bay in Oakland, Calif.

major strength is the integration into the supported base. The base CO directly controls the PW mission through the public works officer (PWO). The major weakness of the PWD model is the financial inflexibility resulting from annual mission funding.

A second significant weakness is that PWDs obtain much of their technical support from outside the organization, usually from the regional engineering field division (EFD). This relationship has worked well in the past, but mission funding by Naval Facilities Engineering Command (NAVFAC) to EFDs for public works support has been reduced by more than 50 percent in recent years, leaving the PWD in a technical support void.

Public works centers typically support Navy activities that are concentrated in or near a naval complex. The major strength of the PWC is financial flexibility through the Defense Business Operating Fund (DBOF). Another strength is its internal technical support capability, providing strategic planning and program management. The major weakness of the PWC model is the lack of direct control by customer commands, leading to the perception that PWCs are not responsive to changing customer requirements.

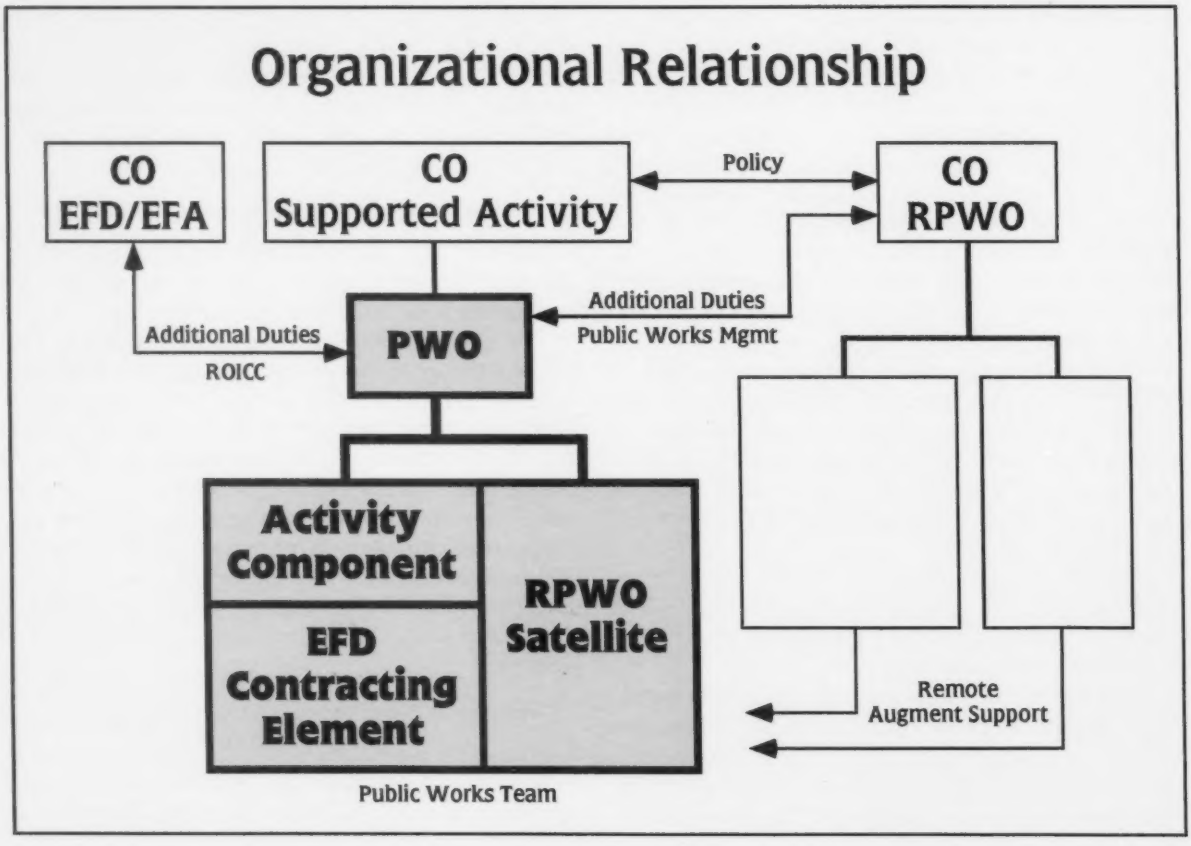
A second major weakness is the perceived high cost of PWCs, with complex accounting systems and burdensome overhead.

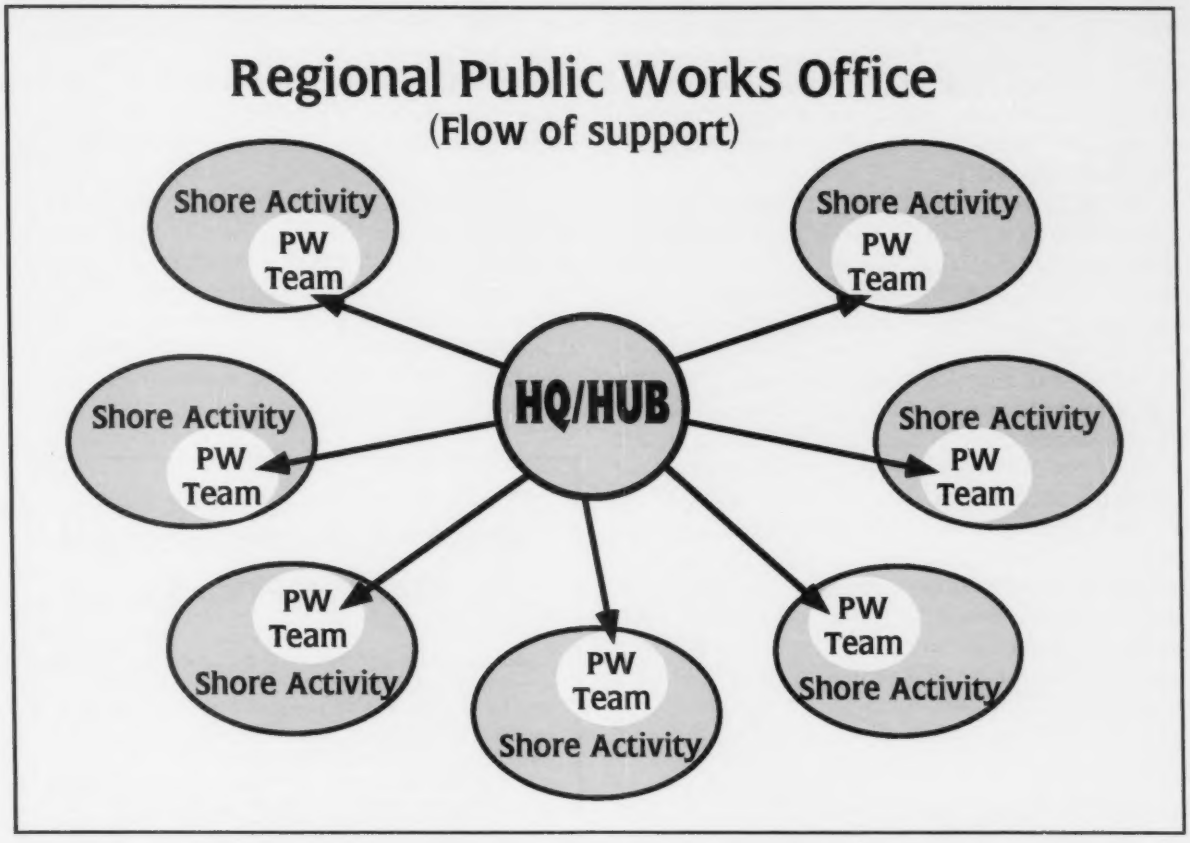
Generally, the strengths of PWDs are the weaknesses of PWCs. Conversely, the strengths of PWCs are the weaknesses of PWDs. Is there a way to combine the strengths of these two models while rejecting the weaknesses?

The design criteria for this new "optimum" model would be lower total cost of service, more responsive service, higher quality service or product, and greater customer control.

One vision: the Regional Public Works Concept

In May 1994, Captain Al Wynn, CEC, USN, then-commanding officer of Navy Public Works Center San Francisco Bay, proposed a new public works platform that approaches the "optimum" solution. The concept is a regional public works command with a "hybrid" organi-





zation, providing the optimum mix of centralization and decentralization. Management is centralized with execution decentralized.

Drawing from the strength of a PWD, the productive work force is decentralized with operational control maintained locally at supported bases. Drawing from the strength of the PWC, strategic planning, program management, financial management and other business processes are performed for the region from a central location.

The NAVFAC Public Works Support Division performed a detailed analysis of a hypothetical regional public works organization in Central California. The analysis showed the regional approach generated potential savings of 20 percent, or $36 million, for the total annual cost of public works services.

What is the Regional Public Works Concept ?

The Regional Public Works Concept calls for a regional service command—the Regional Public Works Office (RPWO)—that is a hybrid organization and uses a DBOF financial structure. The RPWO operates through management partnerships.

The RPWO supports four to eight large Navy shore activities within a geographic region. The RPWO has three major components: the public works team, the headquarters and the hub.

• Public works team (PWT). The PWT, located at the supported base, supports day-to-day public works requirements. The PWT has service capability in facility maintenance, utility operations and maintenance, transportation, planning and engineering support, procurement (services, construction and material), housing management and environmental compliance. This work force is operationally controlled by a public works officer, who works directly for the base commanding officer.

• Headquarters (HQ). The HQ performs regional program management for utilities, transportation, facility maintenance and material delivery. The HQ provides business process support, including strategic planning, financial management and information systems manage-

ment. The HQ includes functional business units for engineering design, housing management and contracted PW services using regional indefinite quantity contracts. The HQ also provides internal command support to RPWO organization while facilitating partnerships with supported customer commands.

• Hub. The Hub provides augment public works services from a central location(s) to the PWTs on a reimbursable basis. In-house Hub services include minor construction, environmental remediation, utility repairs, transportation equipment rental and testing and certification.

The hybrid organization of the RPWO creates the optimum mix of centralization and decentralization. Work execution and its operational control are primarily decentralized through the PWT at the customer base to be most responsive to customer needs. Program management and supporting business functions are centralized at the HQ and Hub to gain efficiencies and greater specialized capability.

The Defense Business Operating Fund allows the RPWO to operate efficiently using sound business investment strategies. DBOF provides full cost visibility, softens the impact of the annual funding cycle through a revolving fund, and allows customer commands to pay only for what they order from a "menu" of available services.

From the customer perspective: What's in it for me?

The Regional Public Works Concept provides lower total cost for services. Through the hybrid organization, the RPWO is able to achieve equal or greater capability for less overall cost. Improved business processes allow for proper investment and replacement, delivering more reliable utility systems and transportation fleets. Long range maintenance planning for facilities increases building system reliability. Significant process improvement in material support, contracting support and in business processes work collectively to improve response on public works requirements. Powerful tools are added to the execution toolbox. Finally, the RPWO gives the base commanding officer the enhanced capability, resources and operational control needed to get the job done.

Regional public works initiatives

The RPWO concept is moving forward with key initiatives. In October 1994, Public Works Center San Francisco Bay established a pilot RPWO public works team at Naval Weapons Station Concord, Calif. The pilot is testing the processes of shared control and remote support.

In September 1995, NAVFAC established a public works detachment in Philadelphia, Pa., which is operationally linked to PWC San Francisco Bay. The new Philadelphia detachment is developing regional service contract capability in support of PWDs throughout the Northeast.

Public Works Center San Diego is evaluating the use of RPWO concepts to enhance service to its local and regional customers. The PWC is looking at shared control of a public works team at Naval Amphibious Base Coronado, Calif. The PWC Corporate Steering Group, chaired by the NAVFAC director of public works support, continues to identify and evaluate opportunities to employ variations of the RPWO concept. ❑

Have you considered the reserves?

If you are a young construction professional in civilian practice or civil service, or are a graduating engineering or architecture college senior who has already selected a career path, the reserve Civil Engineer Corps may have a place for you. Qualified young professionals have the chance to achieve tremendous personal and professional satisfaction through:

• Direct appointment as an ensign, Civil Engineer Corps, U.S. Naval Reserve

• Challenging assignments within the reserve Naval Construction Force units in your geographic locale, in areas paralleling active duty in the Seabees or in facilities management

• Development of leadership and technical skills that will carry over directly into your civilian profession

Here's what you can do...
If you are a young engineer or architect, please call or write the reserve representative listed below.

Commander Alan Terpolilli, CEC, USN
Commander, Naval Surface Reserve Force (Code N53)
4400 Dauphine St.
New Orleans, La. 70146
Phone: (504) 678-5798 • DSN: 678-5798

An active duty accessions officer listed on page 30 may also be contacted for information.

PWC Det Philadelphia is commissioned

By Ronald L. Deacon, P.E.

On Sept. 15, 1995, the Navy Public Works Center (PWC) Detachment Philadelphia opened for business as a detachment of PWC San Francisco Bay. PWC Detachment Philadelphia, located in the Philadelphia Naval Shipyard, reports directly to the commanding officer of PWC San Francisco Bay. The detachment, which was officially commissioned on Sept. 21, has 361 full-time equivalent civilian personnel to provide the full range of public works support services to Navy customers in the Philadelphia area. Commander Hal Thomas, CEC, USN, is the officer-in-charge PWC Detachment Philadelphia.

In October 1991, the Base Realignment and Closure Commission (BRAC 91) directed closure of Naval Base Philadelphia, Naval Station Philadelphia and the Philadelphia Naval Shipyard (PNSY). BRAC 91 also directed that three major Philadelphia Naval Base activities—the Naval Surface Warfare Center Carderock, Naval Inactive Ships Maintenance Facility and the Navy Propeller Facility—remain in an active status.

PNSY provided public works support services to the Philadelphia Naval Base and its tenant commands. With operational closure of PNSY on Sept. 15, 1995, public works responsibility were transferred to the new PWC detachment to support the continuing missions of the remaining active commands. In addition, public works support and caretaker maintenance will be needed for Navy excess property during the reutilization and disposal process. Other Navy activities in the Philadelphia area have also historically relied upon PNSY for a portion of their public works requirements.

The transition to a PWC detachment began with the creation of a PNSY Public Works Transition Office on Feb. 27, 1995. Captain Samuel Saltoun, CEC, USN, PNSY public works officer, led the transition with Ronald Deacon from the Naval Facilities Engineering Command (NAVFAC) serving as the business manager.

Shortly thereafter, PWC San Francisco Bay (PWC SFB) was designated by NAVFAC to be the parent command for the new detachment. Additional support was received from PWCs in Washington, D.C., Pensacola and Jacksonville. A dedicated effort was required to establish the first NAVFAC PWC detachment in such a short time frame. ❑

New PWC det provides public works support to Navy customers in the Philadelphia area.

Ronald L. Deacon was the business manager for the Philadelphia Naval Shipyard Public Works Transition Office.

Improving customer satisfaction at PWC Washington

The command takes a proactive approach to improving performance

By CDR William M. Elvey, CEC, USN

Since its creation in October 1992, Navy Public Works Center (PWC) Washington, D.C., has worked to provide total customer satisfaction. This article reviews progress made by PWC Washington in its quest to provide customer satisfaction.

PWC Washington provides public works services on a fee-for-service basis to more than 300 Department of Defense (DOD) and federal agencies located in the national capital region. In the spring of 1994, PWC Washington conducted its first customer survey, which established a baseline measurement of customer satisfaction. When the heads of major customer activities were asked, "What is your overall evaluation of our [PWC] performance?" The majority of those surveyed indicated that "the jury is still out." The survey results also identified several areas of customer concern needing management's attention.

After the 1994 survey, PWC Washington started a number of actions to improve customer satisfaction. PWC Washington later conducted its second annual customer survey, and the preliminary results show a significant improvement in customer satisfaction.

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A 1947 presidential commission recommended that government industrial-type activities consolidate where possible. The Navy tried this concept in 1948 with its first PWC in Norfolk, Va. Because of its success, eight more PWCs were eventually formed, consolidating more than 80 PWDs.

In 1990, the Department of Defense (DOD) directed, in a Defense Management Report Decision, for even more consolidations of PWDs. The goal was to obtain additional efficiencies through the consolidation of PWDs. The report put into motion plans for a new Navy PWC in the Washington, D.C., area.

PWC Washington, which opened in the fall of 1992, is a merger of six public works departments (PWDs) from the Naval District Washington, the Naval Research Laboratory, the Naval Security Station and the Naval Observatory, all in Washington D.C.; the National Naval Medical Center, Bethesda, Md.; and the Naval Surface Warfare Center, White Oak, Md.

Background: PWCs vs. PWDs

In a PWD, the public works officer (PWO) works directly for the base commanding officer (CO) for all public works services. All public works services are paid for with appropriated funds provided to the base CO for maintenance of real property. However, many of the routine costs to provide public works support are not easily discernible to the base CO. For instance, there are general and administrative costs such as material support, public affairs, safety, legal, security, military personnel, non-salary personnel costs such as retirement costs, and costs for comptroller functions. These functions and costs are dispersed throughout the host command and also support other activities besides the PWD.

In a PWC, industrial fund rates (charged to customers) include surcharges that pay for the infrastructure. Because all products and services are provided on a fee-for-service basis, all costs are "visible" and a PWC customer pays the actual cost of getting the work done. This makes it possible for Navy commands to make smarter facilities management decisions. Additionally, many Navy tenant commands own their facilities

CDR William M. Elvey is the executive officer of Public Works Center Washington, D.C.

Head of Activity Assessments

Response by the head of the activity to the question

"What is your overall evaluation of our performance?"

	1994		1995	
	Number of Replies	Replies weighted by prior year sales	Number of Replies	Replies weighted by prior year sales
Delighted (5 pts)	0	-0-	1	0.2%
Happy (4 pts)	6	9.3%	3	36.2%
Satisfied (3 pts)	3	0.6%	8	24.3%
Jury is Out (2 pts)	12	89.1%	9	38.5%
Dissatisfied (1 pt)	2	1.0%	2	0.8%
Average Rating:	2.56	2.18	2.65	3.06

Responses are weighted against each other on the basis of prior year sales
Responses in 1994 represent 47.5% of total sales
Responses in 1995 as of June, represent 51.2% of total sales

and purchase the public works services they need. This combination of facilities ownership and control of priorities and resources has stimulated better real property management. It also has brought about a greater understanding of the true costs of real property maintenance in the Navy.

A PWC is headed by a CO who reports to a local senior operational flag officer. In addition, the PWC CO has hundreds of additional customers who request (purchase) services from the PWC. Thus, the focus of a PWC is entirely different than a PWD.

Cultural change required

The planning period for establishing PWC Washington was compressed to less than a year. As a result, some management and organizational compromises were required. A major concern was that the transfer of all services from the six individual PWDs to the new PWC be as smooth as possible. Interruption of service to customers was minimized by keeping most of the previous PWD employees in place at their existing locations.

While the decision to keep some employees supported the concern for continuity of service by PWC Washington management, it may have created a separate problem not predicted by PWC Washington's decision-makers.

It was necessary to make employees understand that now the customers—not necessarily the PWC—paid their salaries. Many employees were not sensitive or responsive to the customer needs. The extent of this problem was not known until PWC Washington conducted its employee and customer surveys 18 months later.

PWC Washington Employee Survey —June 1994

A major problem uncovered by a June 1994 employee survey was the need for PWC Washington to have its own organizational identity. According to the survey results, management's efforts to change the culture were not fully accepted by mid-level management and lower ranks of the organization. The change to providing products and services for a fee, and employee understanding of DBOF were lacking, even though PWC Washington provided similar products and services as the former PWDs.

If PWC Washington workers failed to make the basic connection between customer satisfaction and the very purpose of their jobs, the survival of PWC Washington as a busi-

ness entity would be at risk. A push to emphasize the importance of the customer and educate the employees got underway. Everyone attended customer awareness training and meetings with the CO. Statements and articles to support the new customer service philosophy were published in the employee newsletter and other publications.

PWC Washington customer survey—June 1994

In the spring of 1994, PWC Washington conducted its first customer survey, which established a baseline measurement of customer satisfaction. When the heads of major customer activities were asked, "What is your overall evaluation of our [PWC] performance?" the majority answered "the jury is still out." PWC Washington learned from its first customer survey that:

- Communications with customers were strained.
- PWC Washington's product and service quality was highly variable.
- PWC Washington fell short of command-level (for example, the CO) perceptions.
- The majority of customers were less than satisfied.

Post-1994 customer survey actions

After analyzing the 1994 survey results, PWC Washington began efforts to improve customer satisfaction. Actions to improve internal and external communications included:

- Enhanced and expanded customer information system to aggressively track customer work in progress
- Expanded electronic mail and installed Internet capability so geographically remote managers could communicate internally with each other and externally with major customers
- Held a series of staff civil engineer meetings to keep customers informed in a high-level forum for unresolved issues at lower levels
- Initiated comptroller-to-comptroller meetings to resolve a variety of financial management problems
- Initiated a monthly, one-page customer update bulletin to improve external communications
- Conducted a series of "town meetings" between the PWC Washington CO and all employees to improve internal communications
- Started an ambitious training program for all employees based on the ideas presented in the book *The Seven Habits of Highly Effective People*. The goal was to improve teamwork and organizational effectiveness.

If PWC Washington workers failed to make the basic connection between customer satisfaction and the very purpose of their jobs, the survival of PWC Washington as a business entity would be at risk.

PWC Washington recognizes that the quality of its products and services varies. It has taken decisive action to correct perceived shortcomings in areas such as flag housing management (the subject of a separate customer survey) and environmental program management, policy and operations.

The focus of on-going Total Quality Leadership efforts is to improve PWC Washington's products and services. Much emphasis is on employee training and development. A nationally recognized expert on quality, Bill Conway, was brought in to train all PWC Washington supervisors and managers in *The Right Way To Manage* seminar.

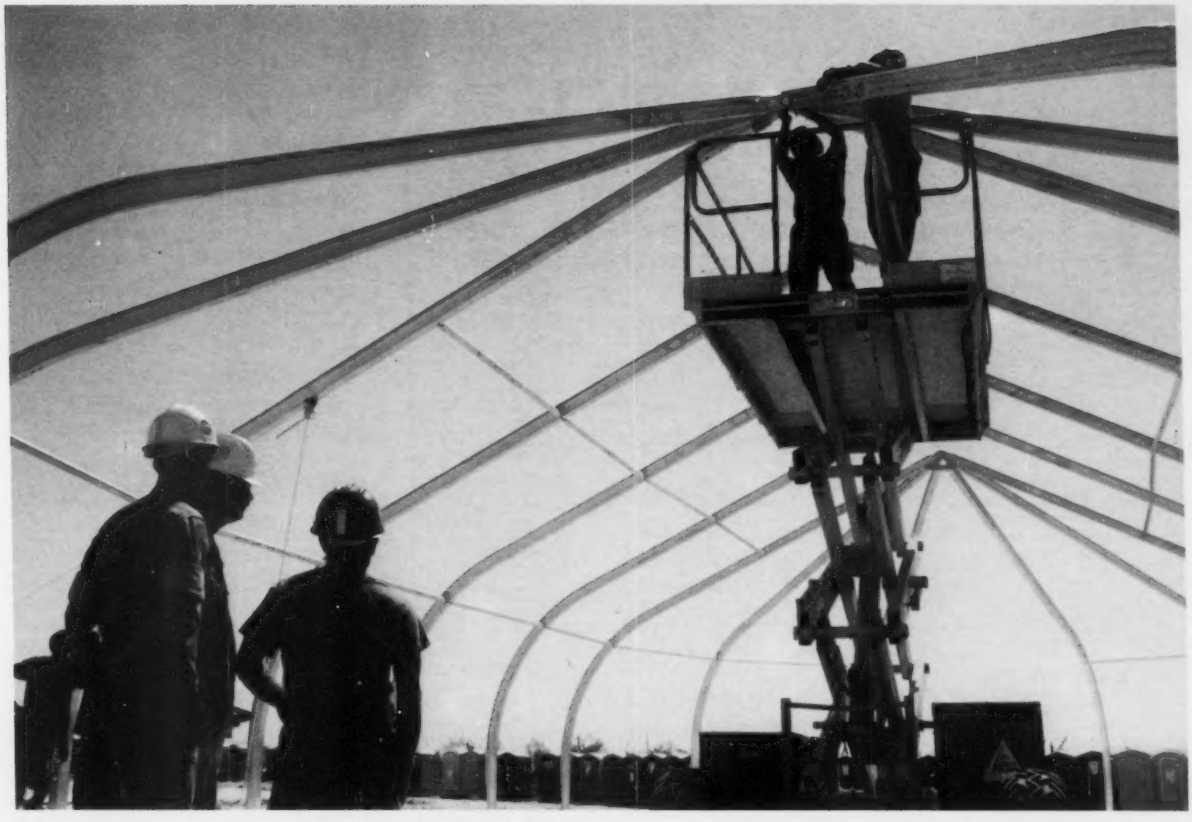
Finally, PWC addressed the poor overall evaluation it received from the heads of major customer commands. The PWC Washington commanding officer, Captain Clay Dean, CEC, USN, now holds quarterly face-to-face meetings with the heads (COs and flag officers) of those commands. He gets first-hand feedback on customer satisfaction rather than waiting for information from other sources such as annual customer surveys.

Has PWC Washington made progress toward improving customer satisfaction?

PWC Washington has conducted its second annual customer survey. The cover letter forwarding the 1995 survey to PWC Washington's customers stated, "We appreciate your honest appraisal of our work. We are especially interested in identifying how service quality has changed since last year. You funded a significant portion of our work which we performed in FY 94, and we need to know how satisfied you are with the value you received for your money."

Results of the 1995 customer survey show a significant improvement in customer satisfaction at PWC Washington.

This time around, when the heads of major customer activities were asked, "What is your overall evaluation of our [PWC] performance?" the majority of survey respondents no longer answered "the jury is still out." Rather, the majority of customers have now gone on record to say they are satisfied, happy, or even delighted, with PWC Washington's customer service. ❑



Seabees erect a tension fabric recreation building.

Seabees improve quality of life for migrants at Guantanamo Bay, Cuba

By CDR Stephen E. Barker, CEC, USN

One would not expect Seabees to learn about Joint Operations on a Navy base. However, that is what happened in Guantanamo Bay, Cuba, when Joint Task Force 160 constructed facilities to improve the quality of life for more than 20,000 Cuban migrants during Operation Sea Signal.

The Second Naval Construction Brigade stood up the 22nd Naval Construction Regiment (Forward Element) in late November 1994. The 22nd NCR (FWD) arrived in-force in early December with 370 Seabees from Naval Mobile Construction Battalion Four and an air detachment from NMCB Seven.

In late November a planning team comprised of seven members of NMCB Four and members of the Second NCB staff assembled in Norfolk, Va., to review initial quality of life designs prepared by Atlantic Division, Naval Facilities Engineering Command. This review resulted in the preparation of bills of material for the $20 million worth of quality of life projects.

The original scope of the quality of life effort consisted of constructing 37 migrant villages arranged in 11 village clusters at two locations, Radio Range and McCalla Field. These sites were located approximately seven miles apart.

The design for each village consisted of approximately 50 strongback tents, one tension fabric recreation building, and concrete masonry unit buildings that provided head, laundry and shower facilities. Each village

CDR Stephen E. Barker is the commanding officer of Naval Mobile Construction Battalion Four.

What does it take to house 20,000 people?

The quality of life project at Guantanamo Bay consists of constructing two tent cities, Camp Radio Range and Camp McCalla, on separate 125 and 150 acre sites. The cities are capable of housing nearly 20,000 migrants. Work completed includes :

- Constructed 1,341 strongback tents
- Installed more than 17 miles of underground piping
- Installed more than 53 miles of high and low voltage cable
- Augered and placed more than 500 power poles
- Constructed 43 tension fabric structures
- Installed more than 9 miles of chain link fence
- Placed more than 11,700 cubic yards of concrete in more than 50 slabs and foundations
- Constructed 67 concrete block buildings
- Received more than 25 million pounds of construction materials
- Constructed 11 K-span buildings
- Used more than 40,000 sheets of plywood
- Constructed and paved 3.6 miles of double bituminous surface treatment roads
- Erected four pre-engineered buildings
- Excavated and hauled more than 105,000 cubic yards of fill
- Operated more than 300 pieces of Civil Engineer Support Equipment for 72,000 hours and 392,798 miles

cluster included a tension fabric chapel, messing facility and a community services building.

Infrastructure support included electricity for all facilities—the strongback tents, water, sewage, roads, sidewalks and recreation facilities. Mobile utilities support equipment (MUSE) units and package sewage treatment plants provided power and sewage treatment capability at the Radio Range and McCalla field sites.

Each site was also supported by a galley complex for food preparation and dry goods storage, a school complex and a tension fabric government building.

Jointness

Upon arrival, the Seabees of the 22nd NCR (FWD) were introduced to the world of jointness. *It was time for a paradigm shift.* Seabees were berthed and messed in a camp operated by the Air Force, reported directly to the Joint Logistics Support Group (JLSG), an Army command, and served under a Marine brigadier general as the Joint Task Force Commander. Once on the ground, the Seabees were no longer a stand alone unit. They had to quickly adapt to jointness and become an integral part of the Joint Task Force.

Seabees arrived in Cuba with hammers in hand and ready to commence construction of strongback tents. Initial supplies of lumber diverted from Florida enabled them to complete 100 strongbacks by Christmas Day. In January 1995 materials to support other facilities and utilities began to arrive from Construction Battalion Center Gulfport, Miss.

As the pace of the work began to quicken, migrant riots in Panama resulted in a decision to return 7,000 migrants to Guantanamo Bay. This return was not anticipated and required the construction schedule and project scope to be altered. Security concerns related to the return of these migrants significantly expanded the construction scope, requiring additional construction forces to meet the infrastructure needs of the Joint Task Force. A detachment from the 820th Red Horse from Nellis Air Force Base was mobilized to augment the Seabees and to focus on K-span construction.

The numerous changes in project

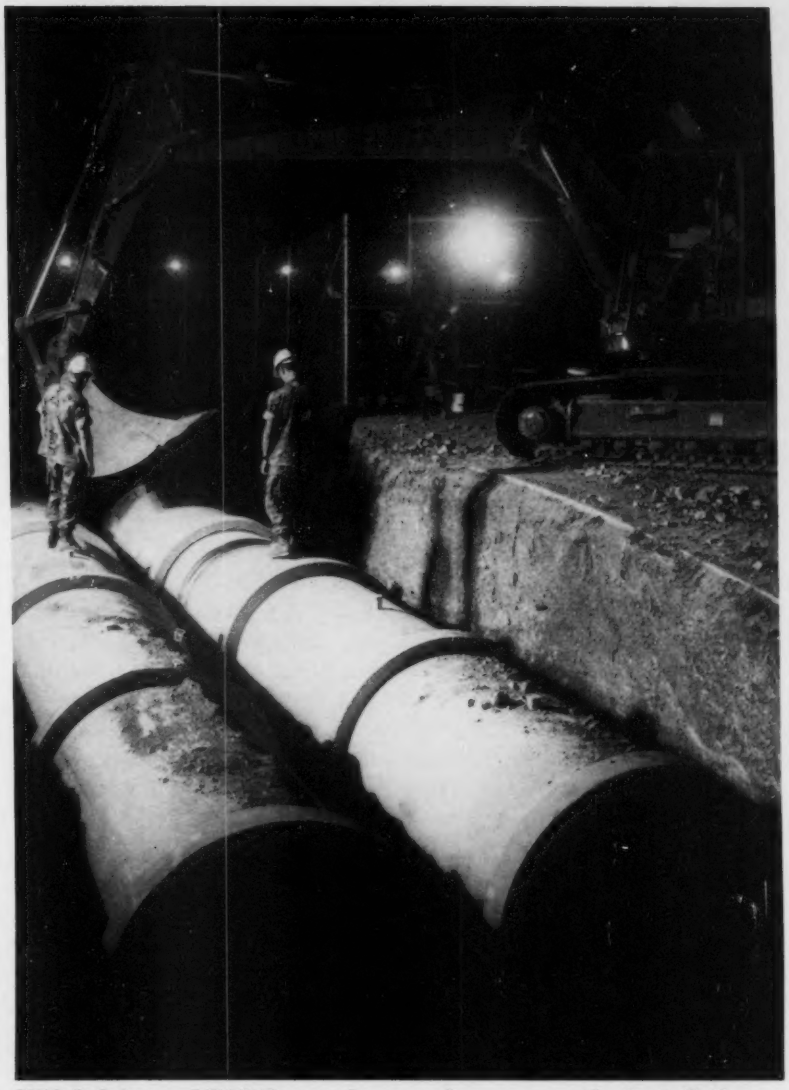
scope resulted in tasking changes that precipitated design and material changes. These changes were successfully addressed at monthly design reviews attended by key representatives of the organizations responsible for design, material procurement, construction, quality assurance and project scope.

The motto of the Joint Task Force 160 Support Group, "Semper Gumby" (be flexible), is applicable in the joint environment. It is rewarding to work with, observe and learn how the various military service conduct business. It is frustrating and counter-productive to attempt to convince others that your way of doing business is the right way. An open mind is a must to succeed in a joint environment.

At the start of the construction effort, the 22nd NCR (FWD) focused on the major quality of life construction in the migrant camps, and non-quality of life tasking was directed to Army and Marine construction units. This approach did not use construction resources effectively and ultimately all engineering units were assigned to the 22nd NCR (FWD).

Combining all engineering assets under the 22nd NCR (FWD) allowed the regimental staff to tailor tasking to engineering units, consciously matching tasks with the skill levels, equipment assets and troop availability of the units. This approach provided the Joint Task Force with a single point of contact for all engineering needs and greatly improved the productivity, efficiency and morale of the construction units.

The effectiveness of the engineering units and personnel assigned to the 22nd NCR (FWD) was significantly enhanced by capitalizing on the skills and knowledge of each unit. Units such as the Air Force's 820th Red Horse detachment and NMCB Seven's air detachment, that arrived as units, were allowed to maintain their unit integrity and were tasked as units. Seabee reservists, Air Force Prime Beef (personnel responsible for maintenance) and augment personnel that arrived as individuals were immediately assigned to units where their skills were needed.



UTC Seigler and EOC Rasure keep a close eye on the installation of two 36" RCP culverts connecting the sewage treatment plant to the Radio Range villages.

These individuals were quickly integrated and immediately became valuable contributors. The desire to capitalize on the construction skills and knowledge of the Cuban migrants further enhanced the effectiveness of the construction effort.

Communication

Effective communications are absolutely essential but often difficult during a joint operation. Vastly different terminology, particularly with respect to supply and vehicle maintenance, make it difficult to readily exchange meaningful information. Common terms aren't always common. If you address someone as

The motto of the Joint Task Force 160 Support Group, "Semper Gumby" (be flexible), is applicable in the joint environment.

chief in the Navy, you're talking to an E7. In the Army a warrant officer is called chief, and in the Air Force an E9 is called chief.

In a joint environment you learn that material comes in classes. If you want construction materials you don't go to a Material Liaison Office (MLO), you go to the Class IV Yard. As the prime user of Class IV material during Operation Sea Signal, the 22nd NCR (FWD) assumed responsibility for running the Class IV Yard for the Joint Task Force. This broader role allowed the 22nd NCR (FWD) to have control of and access to excess materials. These materials were critical to keeping projects on track.

The success of the 22nd NCR (FWD) in Operation Sea Signal resulted in large part from a spirit of cooperation, mutual respect and teamwork that evolves with a willingness by parties to work together focused on a common objective.

The willingness of the Joint Task Force to allow the 22nd NCR (FWD) to manage the engineering resources and determine the best means of accomplishing tasked work with input from subordinate engineering units greatly enhanced productivity and significantly improved the skills and morale of the Joint Engineering Force. Although numerous changes in the quality of life construction tasking occurred during the work execution, honest, open and effective communications ensured that all parties completed the effort in a timely manner.

In a joint environment where a major construction effort is required, it is essential the construction be effectively managed as a program, and the unit responsible for executing the construction program has the ability to influence material, design, equipment and labor requirements. If the needs of the Joint Task Force Commander are to be fulfilled, the construction forces must be provided specific tasking and timely logistic support.

Construction capability and infrastructure are critical to the operational success of a joint operation. The sooner the engineers are involved in the planning process, the greater the chance of success. Design, material procurement and construction of the migrant villages at Guantanamo Bay, Cuba, in seven months serve as a testament to the success that is attainable when operators and engineers jointly focus on a common objective. ❑

Alpha company equipment operators perform final grading on the soccer field and basketball courts in a recreation area.

USS Stethem is commissioned

Guided missile destroyer named for slain Seabee

By JO3 Dawn M. Davis

As the passengers of hijacked Trans World Airlines flight 847 bound for Beirut, Lebanon sat motionless, ravaged by fear, one of the hostages, a 23-year-old Waterbury, Conn., native stared hate squarely in the eyes that day of June 14, 1985.

Singled out as a U.S. Navy sailor, he was killed by terrorists as the plane sat on the tarmac in Beirut, Lebanon. That sailor, whose death symbolizes the ultimate sacrifice a servicemember can make for his country, was Steelworker Second Class Petty Officer Robert Dean Stethem.

The memory of Petty Officer Stethem was immortalized on Oct. 21, 1995, when the Navy's newest Aegis guided missile destroyer was commissioned as the *USS Stethem*.

"The commissioning of *USS Stethem* is a special event for many reasons. One of which is her namesake, who is a sailor of recent heroism," said Commander Steven C. Miller, commanding officer of the $900 million destroyer.

"Life ends, but memories are forever," were the words of Stethem's father, Richard, as he looked out among a sea of more than 5,000 guests and dignitaries who gathered at the Naval Construction Battalion Center Port Hueneme, Calif., to honor the life and service of the Navy Seabee and diver.

In keeping with naval tradition, destroyers are named for heroes. A destroyer's namesake is a sailor who fought courageously and gallantly in the fever of battle, or one who acts alone without the comfort of his shipmates beside him. "Stethem represented each and every member of the armed services. His unwavering inner-strength helped his fellow passengers endure and served as a symbol of the strength of the United States," said the ceremony's principal speaker, the Honorable Steven S. Honigman, general counsel, Department of the Navy.

In her haze gray splendor, *Stethem* stood steadfast against the channel's murky waters. Draped in her ceremonial red, white and blue "dress," she calmly swayed back and forth against the pier as if anxiously awaiting her call to life. Naval tradition says on a ship's commissioning day, she takes

Continued on page 32...

The ship's officers and crew members file by the cheering guests as they prepare to "bring the *Stethem* to life." (Photo by Photographer's Mate Third Class Ben Glade)

JO3 Dawn M. Davis is on the staff of the Seabee Coverall, published by the Public Affairs Office at the Naval Construction Battalion Center in Port Hueneme, Calif.

63 Complete Basic Training at CECOS

Sixty-three members of basic class number 206 have graduated from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif. Course work is comprised of eight weeks of specialized training pertinent to the Navy's needs for shore installation engineering, public works management, construction contracting and administration, and Seabee operations.

Basic Class 206

Graduation: Sept. 27, 1995

ENS Matthew C. Acuff
BSME / BSAE / Univ. of Missouri
to SOUTHWESTDIV, San Diego, Calif.

Mohammed I. Al-Sadhan
BSCE / Saint Martin
to Shaqra, Saudi Arabia

ENS Avonna S. Arnett
BSEE / Univ. of Oklahoma
to SOUTHDIV Cont. Off., New Orleans, La.

LTJG James B. Blanton
BSCS / USNA
to PWC Washington, D.C.

ENS Chad M. Brooks*
MSME / MIT
to NAVWPNSTA, Earle, N.J.

CWO2 Lawrence A. Butler
to UCT One, Virginia Beach, Va.

ENS William A. Buzbee
MSCE / Univ. of California
to NMCB 133, Gulfport, Miss.

ENS Douglas R. Campbell*
BSCE / Worcester Poly. Inst.
to LANTDIV Cont. Off., Guantanamo Bay, Cuba

ENS Mike K. Carlon
BS Aerospace / USNA
to LANTDIV Cont. Off., Norfolk, Va.

ENS Max L. Carroll
BSCE / The Citadel
to PWC Norfolk, Va.

LT James A. Chatfield II*+
BSME / USNA
to NAS, Miramar, San Diego, Calif.

ENS Scott O. Cloyd
BSME / Univ. of Calif. Davis
to OICC Marianas, Guam

ENS Andre L. Coleman
BSOE / USNA
to NAVWPNSTA, Charleston, S.C.

ENS Franklin D. Cox
BSME / Univ. of Mississippi
to SOUTHDIV Cont. Off., Gulfport, Miss.

ENS Andrew B. Crigler
BCE/ Georgia Tech.
to EFA Great Lakes, Ill.

ENS Charles C. Davis
BSCE / Kansas State Univ.
to SOUTHDIV Cont. Off., Jacksonville, Fla.

ENS Isabelle E. Detter
BSCE / N. C. State Univ.
to OICC Marianas, Guam

LT John F. Doran
BSSE / USNA
To LANTDIV Cont. Off., Norfolk, Va.

ENS Joshua P. Drum
BSME / Marquette Univ.
to PWC Great Lakes, Ill.

ENS Michael D. Dysart
BSE / Walla Walla College
to EFA Northwest Cont. Off., Adak, Alaska

ENS Christian P. Fassari
BSOE / USNA
to SOUTHWESTDIV, San Diego, Calif.

ENS Paul A. Feikema
BSCE / Fla. State Univ.
to OICC Marianas, Guam

ENS Franklin D. Fernandez
BSCE / U.C. Berkeley
to LANTDIV Cont. Off.,
Norfolk, Va.

LTJG Thomas F. Fulton
BSOE / USNA
to EFA WEST Cont. Off.,
Concord, Calif.

LTJG Christopher J. Gallagher*
BSAE / Univ. of Texas
to LANTDIV Cont. Off.,
Yorktown, Va.

ENS Aaron D. Gillmore
BSCE / Cal. State Poly. Univ.
to EFA WEST Cont. Off.,
Travis AFB, Calif.

ENS Joseph L. Greeson
BSOE / USNA
to PWC Guam

ENS Troy D. Hamilton
BSAE / USNA
to MARCORBASE,
Camp S.D. Butler, Japan

ENS Kent B. Harrison
BSCE / Univ. of Utah
to NMCB Three, Port
Hueneme, Calif.

LT William K. Hedges
BSCE / USC
to SOUTHWESTDIV
Cont. Off., MCAS,
El Toro, Calif.

ENS Jonathan E. Higgins
BSCE / Univ. of Arizona
to LANTDIV Cont. Off.,
Portsmouth, Va.

ENS Christopher M. Hodrick
BSME / USNA
to LANTDIV Cont. Off.,
Jacksonville, Fla.

ENS Thomas E. Hornyak
BSCE / Old Dominion Univ.
to LANTDIV Cont. Off.,
Little Creek, Va.

ENS Lee Hyok
BSME / George
Washington Univ.
to NAF, Atsugi, Japan

ENS Erik J. Karlson
BSCE / RPI
to NAF Adak, Alaska

ENS Russell D. Kent
BSCE / Univ. of Idaho
to EFA NW, Poulsbo, Wash.

ENS Scott R. King
BSME / Univ. of Virginia
to NAVSTA Guantanamo
Bay, Cuba

ENS Kevin T. Lacey
BSCE / Cleveland
State University
to FISC, Charleston, S.C.

ENS Kirk A. Lagerquist
BSCE / Norwich Univ.
to NMCB Five,
Port Hueneme, Calif.

ENS Scott K. Larson
BSME / Wash. State Univ.
to NAVSTA Panama Canal,
Rodman, Panama

ENS Steven J. Mauro
BSOE / USNA
to NAVAIRWARCENDIV,
Patuxent River, Md.

ENS David H. McAlister
MSCE / Univ. of Tenn.
to NSGA Adak, Alaska

ENS Kevin J. McLoughlin
BSME / Duke Univ.
to SOUTHDIV Cont. Off.,
Beaufort, S.C.

ENS Sean P. McNelis
BSME / Tulane Univ.
to NAVSTA
Pascagoula, Miss.

ENS Thomas M. Moskal
BSME / Univ. of Illinois
to PWC Great Lakes, Ill.

LT Francis S. Mulcahy
BSCE / VMI
to EFA NW Cont. Off.,
NAS Whidby Island, Wash.

ENS Tony Norsworthy
BSCE / Texas A&M Univ.
to SOUTHDIV Cont. Off.,
Barksdale, La.

LT Kenneth R. Osmun*
BSME / Oakland Univ.
to PWC Great Lakes, Ill.

ENS James E. Page
BSME / Univ. of S.C.
to NAVCOMM DET,
Cheltenham, Md.

ENS Charles A. Peterson
BSCE / Duke Univ.
to NORTHDIV Cont. Off.,
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ENS John C. Phillips
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BSCE / Univ. of Oklahoma
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CWO2 Glenn E. Richardson*
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ENS William L. Robertson*‡Ⓘ
BSCE / RPI
to NMCB 74,
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LTJG Gregory E. Selfridge*
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ENS Brian P. Shuster
BSME / Villanova Univ.
to EFA CHES Cont. Off.,
Patuxent River, Md.

ENS Marlene A. Tomaszkiewicz
BSCE / Ill. Inst. Tech.
to NAVSUPPACT,
New Orleans, La.

ENS Carlos L. Tranivalentin
BSEE / Ill. Inst. Tech.
to PWC Pensacola, Fla.

ENS Eric D. Valerga
BSSE / USNA
to EFA WEST Cont. Off.,
Travis AFB, Calif.

LT Gregory S. Wagner
BSME / USNA
to PWC San Diego, Calif.

ENS Adam J. Whipple
M. Arch. / Univ. of Ill.
to LANTDIV Cont. Off.,
Roosevelt Roads,
Puerto Rico

ENS Jason D. Zeda
BSME / Tulane Univ.
to OICC MIDPAC,
Pearl Harbor, Hawaii

* With Distinction
‡ Class Commander
Ⓘ First in Class

Reserve Officers

These reserve officers were part of basic class 206 during the period July 10, 1995 through July 26, 1995.

ENS George C. Chan
BSCE / Univ. of Hawaii

ENS Antonio Leonardo
MBA / Frostburg State Univ.

ENS James A. Robbins
BSEE / Oklahoma State University

ENS Rafael Velazquez

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1220 Pacific Highway
San Diego, CA 92132-5100
(619) 532-3859

LT Paul F. Webb, CEC, USN
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Army, Navy, Air Force and Marine Corps students in the ITRO engineering technician course receive training on modern equipment.

Seabees participate in joint service training

Joint service engineering training for equipment operators and engineering aids is underway at Fort Leonard Wood, Mo.

Students from each of the armed services attend common core classes then branch out for additional service-unique training. This joint service training is driven by the Interservice Training Review Organization (ITRO), which was created to reduce costs in the Department of Defense by consolidating similar training in the Armed Forces.

Utilitiesmen (plumbers) and electricians are trained at Shepard Air Force Base in Wichita Falls, Texas; builders and steelworkers are trained at the Naval Construction Training Center in Gulfport, Miss.; and mechanics are trained at the Naval Construction Training Center in Port Hueneme, Calif.

Joint service training has and will bring the services closer together. Lessons learned from joint operations in Panama, Somalia and Southwest Asia showed that simple differences in terminology can cause major misunderstandings. One popular joke says, "If you tell a marine, a sailor and an airman to secure a building, the marine will sweep for hostile forces and occupy it, the sailor will lock it up, and the airman will lease it with an option to buy."

Training with other service members will help close the gaps and enable future joint venture operations to run smoothly.

CBC Gulfport awarded Navy Unit Commendation

The Secretary of the Navy has awarded the Navy Unit Commendation to the Naval Construction Battalion Center Gulfport, Miss. The CBC personnel consistently demonstrated unparalleled success in providing logistic support to the operating forces of the Navy during Operation Sea Signal and Able Vigil and the Haitian relief effort in Guantanamo Bay, Cuba, from May 1994 to December 1994.

During this period, CBC personnel purchased, packed and shipped more than 6,000 line items of material and equipment valued at approximately $70 million.

NAS Whidbey Island removed from NPL

The Seaplane Base at Naval Air Station Whidbey Island has been removed from the National Priorities List. It is the first Navy base to be removed from the NPL. The teamwork and cooperation shown by NAS Whidbey Island and Engineering Field Activity Northwest allowed the community relations, restoration advisory board input and regulatory oversight to be accomplished professionally and in a timely manner.

The Seaplane Base's areas of concern included an old salvage yard, a land fill, an industrial complex disposal area and a seaplane aircraft hangar. More than 1,300 cubic yards of soil were excavated and replaced. The soil removed was placed in a specially designed cap in Ault Field, where it will no longer be a threat to the environment. The area from which the clean soil was obtained was made into a freshwater wetland, adding to the base's wetland creation program.

Southern Division Named "Top Gun"

Southern Division, Naval Facilities Engineering Command has been honored as the Air Combat Command's Outstanding Design Agent of the Year for FY 95.

SOUTHDIV was recognized as the Air Combat Command's "Top Gun" for its design of the ACC's military construction program.

Continued on page 32...

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Top Gun...
Continued from page 31

The award was based, in part, on the more than $65 million of innovative design projects accomplished at Barksdale Air Force Base in Shreveport, La., and at Shaw Air Force Base in Sumter, S.C. SOUTHDIV also has more than $50 million of design and more than $60 million of construction projects at the Charleston Air Force Base.

Stethem...
Continued from page 27

on a unique personality and is imbued with the will, the spirit and the dedication of those who serve in her.

"Officers and crew of the *Stethem*, man our ship and bring her to life!" commanded Patricia L. Stethem, the ship's sponsor and mother of her namesake.

"Aye, aye, ma'am!" responded the officers and crew as they ran single-file up the forward and aft brows, manning the rails from bow to stern.

The hush over the crowd was broken as the gas turbine engines began to whir and *Stethem* took her first "breath."

The forward and aft gun mounts and the dome of her Closed-in Weapons Systems began to rotate in full 360 degree patterns as an aft missile launcher coughed smoke from its barrels. As the smoke rose from her stacks, the ship's horn blared, announcing her entry into the proud ranks of naval destroyers. ❑

Adapted from the Nov. 3, 1995, Seabee Coverall, Port Hueneme, Calif.

Inside Back Cover:

The *USS Stethem*, the Navy's newest Aegis guided missile destroyer, was commissioned on Oct. 21, 1995.

The *Stethem* is named after a young Seabee—Steelworker Second Class Chief Petty Officer Robert Dean Stethem—who was killed by terrorists in 1985.

For more about the *Stethem*, turn to page 27. (Photo by Photographer's Mate Third Class Ben Glade)

ETHEM DDG-63

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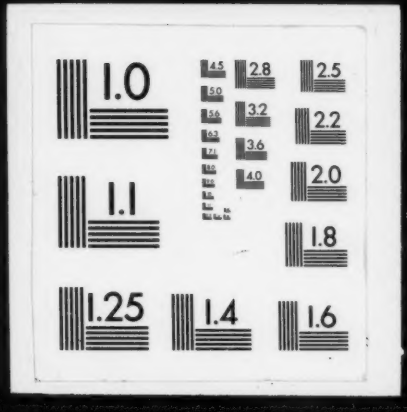
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